

his brother-in-law, the late Mr. Shaw, for the valuable assistance he afforded him in the whole course of his investigations on the nerves.

*On the Reduction to a Vacuum of Captain Kater's convertible Pendulum.* By Captain Edward Sabine, of the Royal Artillery, Secretary to the Royal Society. Read June 18, 1829. [*Phil. Trans.* 1829, p. 331.]

Recent investigations having shown that the method employed by Captain Kater for the reduction of his experiments on the length of the pendulum vibrating seconds in air, to that of the same pendulum *in vacuo*, was founded on erroneous principles, the author undertook to ascertain, by direct experiment, the actual difference of the number of vibrations of the pendulum employed by Captain Kater, in air of ordinary density, and in highly rarefied air. The alteration of density in the medium in which the pendulum is swung, would, in the first place, if its form were not symmetrical, affect its convertibility; that is, the same adjustment of the axes which gave an equality of oscillations in reversed positions, when vibrating in air, would not afford the same equality in a more rarefied medium. It follows also, from the corrected investigation, that the amount of the retardation occasioned by the air is considerably greater than what had been originally computed from the simple consideration of buoyancy.

These inferences have been fully confirmed by the experiments of Captain Sabine. The increase in the number of vibrations *per diem* with the convertible pendulum as it was used by Capt. Kater, that is, vibrating with the great weight below, *in vacuo*, above those in air of the temperature of  $49^{\circ}$ , under a pressure of 30 inches of mercury at  $32^{\circ}$ , was 15.71: when inverted, the other conditions remaining the same, the increase was 16.13 vibrations *per diem*.

Captain Kater had observed that considerable changes in the hygrometric state of the atmosphere destroyed the convertibility of his pendulum, from their affecting the weight of the pieces of wood at both of its ends. In order to remove this source of error, and also to ascertain its amount, the author first reduced the wooden tail-pieces from 17 inches, their original length, to 6.4 inches. The increase of the number of vibrations was then, with the great weight above, 14.91, and with the great weight below, 12.41 *per diem*. When the wooden tail-pieces were wholly removed, and slips of brass substituted for them, the increase was further reduced, in like circumstances, to 12.83 in the former case, and 11.58 in the latter.